

Application No. 09/761, 923

Docket No.: JCLA6211-R

**REMARKS****Present Status of the Application**

Claims 1-15 remain pending of which claims 1, 8-10 and 12 have been amended for providing clarification. This Amendment is promptly filed to place the above-captioned case in condition for allowance. No new matter has been added to the application by the amendments made to the claims, specification or otherwise in the application. For at least the following reason claims 1-15 are proper condition for allowance. A notice of allowance is respectfully solicited.

**Response to Rejections under 35 U. S. C. 103**

*1. The Office Action rejected claims 1-15 under 35 U.S.C. 103(a) as being unpatentable over Liu et al. (US-6,326,300, hereinafter Liu) in view of Chhagan et al. (US-6,303,447, hereinafter Chhhagan).*

*In rejecting the above claims, the Office Action stated that Liu discloses all of the features of the claimed invention except performing the etching step on the masked undoped dielectric layer to remove the implanted/doped region to form a second opening in the undoped dielectric layer using chemical vapor HF etching. However, The Office Action relied on Chhagan for teaching the step of removing a masked undoped dielectric layer 26 using vapor HF etch.*

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*The Office Action further alleged that Liu's step of etching the undoped dielectric layer 22 to remove the ion implanted region/doped region forms a second opening in the undoped layer 22 and the second opening exposes a portion of the undoped layer 22 below the implanted /doped region.*

Applicants respectfully disagree and traverse the above rejections as set forth below. Independent claim 1 has been amended and is thus allowable over Liu and Chhagan for at least reason that both Liu and Chhagan failed to teach, suggest or disclose every features of the claimed invention.

More specifically, Liu and Chhagan failed to teach, suggest or disclose at least the steps of "performing an ion implantation step with the mask on the undoped dielectric layer, so that a doped region is formed in the exposed portion of the exposed undoped dielectric layer below the first opening, leaving the exposed portion of the undoped dielectric layer below the doped region undoped,...", "performing a chemical vapor etching step with the mask on the undoped dielectric layer to remove the doped region, thereby forming a second opening in the undoped dielectric layer, wherein the second opening exposes the exposed portion of the undoped dielectric layer below the doped region" and "performing a dry etching step with the mask on the undoped dielectric layer, so that the exposed portion of the undoped dielectric layer below the doped region and a portion of the doped dielectric layer below the second opening are removed to expose a portion of the substrate".

Liu discloses an ion implantation treatment 26 to form the ion implanted dielectric layer 22' having an ion implanted region **through** the dielectric layer 22', as shown in Fig. 5, leaving

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none of the dielectric layer 22' undoped below the ion implanted region. Liu also discloses using the second etching plasma 28 to remove the ion implanted regions in ion implanted blanket dielectric layers 22' and 12', by etching through the second dielectric layer 22' and then etching through the first dielectric layer 12'(col.11, lines 15-32). Liu in fact discloses, after the ion implantation step 26, performing one etching step 28 to etch away the ion implanted regions through the second dielectric layer 22' (for forming trench 23) and the first dielectric layer 12' (for forming via 13). As shown in Fig. 6, the trench 23 cuts through the dielectric layer 22', while the via 13 cuts through the dielectric layer 12'.

Obviously, Liu does to teach or suggest performing an ion implantation step to form a doped region in the exposed portion of the undoped dielectric layer below the first opening, leaving the exposed portion of the undoped dielectric layer below the doped region undoped, because Liu's ion implanted regions are through the dielectric layers 22', 12'. Furthermore, it is impossible for Liu, as alleged by the Office Action, to teach etching the undoped dielectric layer 22 to remove the ion implanted region/doped region forms a second opening in the undoped layer 22 and the second opening exposes the exposed portion of the undoped layer 22 below the implanted /doped region, since the second opening formed from removing the ion implanted region cuts through the layer 22, leaving none of the dielectric layer undoped below the ion implanted region. In fact, Liu merely teaches one etching step 28, but fails to disclose using two different etching steps to remove, one by one, the doped region and the undoped region for the exposed portion of the undoped dielectric layer. In conclusion, it is unconvincing to cite Liu for suggesting or teaching the features emphasized above.

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Chhagan merely discloses removing a doped silicon oxide layer 26 by using vapor HF etching. However, Chhagan fails to remedy deficiencies of Liu, because Chhagan does not teach or suggest the lacking features emphasized above.

*The Office Action further asserted that obviousness is established to combine the references Liu and Chhagan to produce two different etching steps by employing Chhagan's HF vapor etch to Liu's etching step, because Chhagan teaches advantages of using HF vapor etch in high selectivity of doped silicon oxide to undoped silicon oxide.*

Applicant respectfully disagrees with this assertion.

For one skilled in the art, even if considering employ Chhagan's HF vapor etch to Liu's etching step as suggested by the Office Action, it only achieves one single etching step using HF vapor to etch the first and second dielectric layers 22, 12. That is, after considering the advantages of HF vapor etch in high selectivity of doped silicon oxide to undoped silicon oxide mentioned by Chhagan, one skilled in the art will replace Liu's etching step with Chhagan's HF vapor etch, rather than combining Liu and Chhagan to produce two different etching steps. From Liu's disclosure and Fig. 5, it is clear that the ion implanted region **through** the dielectric layer 22' is in direct contact with the ion implanted region **through** the dielectric layer 12', as shown in, leaving none of the dielectric layer 22' undoped below the ion implanted region. Therefore, it is unnecessary to use two etching steps to remove Liu's ion implanted regions, since no undoped portion exists between these two ion implanted regions.

In determining whether even a prima facie showing of obviousness exists, it is necessary to ascertain whether the prior art teachings suggest the claimed combination to one of ordinary

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skill in the art. The burden of establishing a prima facie showing of obviousness rests upon the Patent Office, and that burden has not been met yet.

Both Liu and Chhagan fail to teach, suggest or disclose each and every feature of the present invention, and therefore they cannot possibly arrive the claimed invention, as suggested by the Office Action. Accordingly, Applicants respectfully submit that amended independent claim 1 patentably distinguishes over Liu or Chhagan. Further, since other claims 2-15 depend from claim 1, therefore claims 2-15 also patently define over Liu and Chhagan for the same reasons as discussed above.

Reconsideration and withdrawal of these rejections are respectfully requested.

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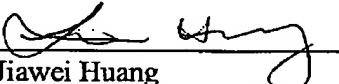
**CONCLUSION**

For at least the foregoing reasons, it is believed that all pending claims 1-15 are in proper condition for allowance. If the Examiner believes that a conference would be of value in expediting the prosecution of this application, he is cordially invited to telephone the undersigned counsel to arrange for such a conference.

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